

Efficiency Maine Small Business Audit Program



Basic Walk-through Energy Audit provided for:

Town of Lamoine Fire Department



February 17, 2012



Energy Audit Report

The Efficiency Maine Basic Walk-through Energy Audit program is for small businesses in Maine. The objective of the walk-through energy audit is to perform a cursory review of your building envelope, lighting, heating system, air conditioning, domestic hot water and equipment and provide you with a report that identifies energy conservation measures that will guide you in pursuing incentives, programs and help you to save energy.

The energy audit is a guide and will identify measures that are applicable to Efficiency Maine programs listed below:

- **PRESCRIPTIVE INCENTIVES** - Efficiency Maine has calculated fixed or “Prescriptive Incentives” for certain types of equipment that generates consistent savings over a wide range of applications, including: lighting, HVAC equipment, variable-speed motor drives, commercial refrigeration, and agricultural equipment. <http://www.efficiencymaine.com/at-work/business-programs/incentive-applications>
- **CUSTOM INCENTIVES** - are offered to encourage creative solutions by supporting energy-efficient electrical equipment for which costs and savings vary by application. These calculations are supplied by the vendor and then reviewed by our engineering staff. <http://www.efficiencymaine.com/at-work/business-programs/incentive-applications>
- **SMALL BUSINESS LOAN PROGRAM** - Efficiency Maine provides loans up to \$35,000, currently at 1% interest, to help small businesses fund approved energy conservation measures of all types: electrical equipment including lighting, machinery, HVAC and refrigeration; heating equipment, regardless of fuel type; insulation. An energy audit identifying recommended energy efficiency measures is required. <http://www.efficiencymaine.com/at-work/for-small-business/loan-programs>
- **QUALIFIED PARTNERS** - is a designation for the most experienced vendors, contractors, suppliers and other professionals that supply or install energy-efficient equipment. These Qualified Partners are familiar with the Efficiency Maine programs, and can help you select qualifying equipment and apply for cash incentives for your energy-efficiency project. <http://www.efficiencymaine.com/at-work/qualified-partners>



Ask your contractor/qualified partner to work with Efficiency Maine

You or your contractor can call 866-376-2463 with any questions concerning any of the programs above. The Efficiency Maine field staff will work directly with you or your contractor, including visiting the site, to help complete your project!

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<p>DISCLAIMER</p> <p>The contents of this report are offered as guidance. The auditor does not (a) make any warranty or representation, expressed or implied, with respect to accuracy, completeness, or usefulness of the information contained in this report, or that the use of any information, apparatus, method, or process disclosed in this report does not infringe on privately owned rights; (b) that the information apparatuses and processes disclosed in the report are suggestions that require a more complete technical and specific analysis depending upon which suggested approaches are utilized. Mention of trade names or commercial products does not constitute endorsement or recommendation of use. More in depth technical analyses and cost estimates may be suggested. Qualified and properly licensed personnel, in accordance with all state and federal codes and laws, should safely perform any work. All hazardous materials or other materials regulated by law (such as fluorescent lamps and ballasts) should be disposed of safely and properly according to state and federal laws.</p>
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SITE DESCRIPTION & INTRODUCTION

Business name: Town of Lamoine, Fire Department
Physical address: 606 Douglass Highway
Contact person: Stu Marckoon
Business phone: 207-667-2248
Email: town@lamoine-me.gov
Building Sq. Ft.: 5,280
Employees:
Hours of operation:
Business Type: Public Safety, Government
Auditor: Richard (Dick) Fortier
Audit Date: February 7, 2012

Introduction:

The Fire Department building constructed in the early 1990's is wood framed with six inches of fiberglass insulation in the walls and twelve inches in the ceiling. Windows are double pane casement and lighting is fluorescent consisting of strip fixtures and troffers.



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SUMMARY OF RECOMMENDATIONS

Energy Conservation Measures (ECMs) recommended for immediate implementation:

- Consider lighting upgrades by replacing the inefficient T-12 fluorescent lighting. Efficiency Maine cash incentives apply.
- It was reported that the existing boiler heat transfer coil has failed and boiler is being considered for replacement. See the estimated comparison of a new fuel oil vs. propane fired boiler in heating section.
- Repair doors frames and weatherstripping

The energy conservation measure (ECM) recommendations below are based on the walk-through audit of the facility, equipment data plates and the reported estimated building and equipment use.

Estimated Energy Conservation Measures								
	Estimated kWh Savings	Estimated Fuel Oil Savings gals	Estimated Propane Savings gals	Estimated Annual Savings \$ (A)	Estimated Capital Cost (B)	Potential Incentive (C)	Estimated Cost to Business (B) - (C)	Estimated Payback (B) - (C) / (A)
Cost per kWh and Fuel	\$0.169	\$4.00	\$2.16					Years
Follow Lighting Recommendations	1,060	0	0	\$180	\$3,230	\$425	\$2,805	15.6
	Estimated kWh Savings	4	Estimated Propane Savings gals	Estimated Annual Savings \$	Estimated Capital Cost	Incentive	Estimated Cost to Business	Estimated Combined Payback
Totals	1,060	0	0	\$180	\$3,230	\$425	\$2,805	15.6
Estimated Annual Btu savings	3,616,720	0	0	Total Estimated Btu Savings			3,616,720	Btu's
Estimated Annual Carbon Savings	0.8	0.0	0.0	Total Estimated Carbon Savings			0.8	Metric Tons

It is noted that the simple payback for the lighting is over 15 years. This is due to minimal use of the existing lighting. If your lighting use increases, then you may want to consider upgrading your lighting.

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ECM Table Notes

- Please note that some of the energy conservation measures identified in this report may require professional services to implement.
- The ECM estimates are based on the building conditions observed during the audit, the reported building usage and the submitted energy consumption records. These ECM's have been recommended for planning purposes only. You must verify through a contractor, supplier, or a professional that the proposed ECM, product and/or equipment will meet the criteria for Efficiency Maine cash incentives.
- It is your responsibility to determine installation, equipment and labor cost for all estimated ECM's before proceeding. Every effort was made to assure accuracy of the estimated results, however, they do not represent or guarantee, or assume or accept, that these savings, capital cost or simple paybacks will be achieved.
- Please remember that this is a basic walk-through energy audit. Cost estimates were not done based on any design or engineering. They are conceptual only and can be +/- 15%. Professional services may be required to enable an accurate estimate.

If you do not know where to start then contact your contractor or any of the numerous trained Efficiency Maine Qualified Partners who can assist you with your energy conservation projects.

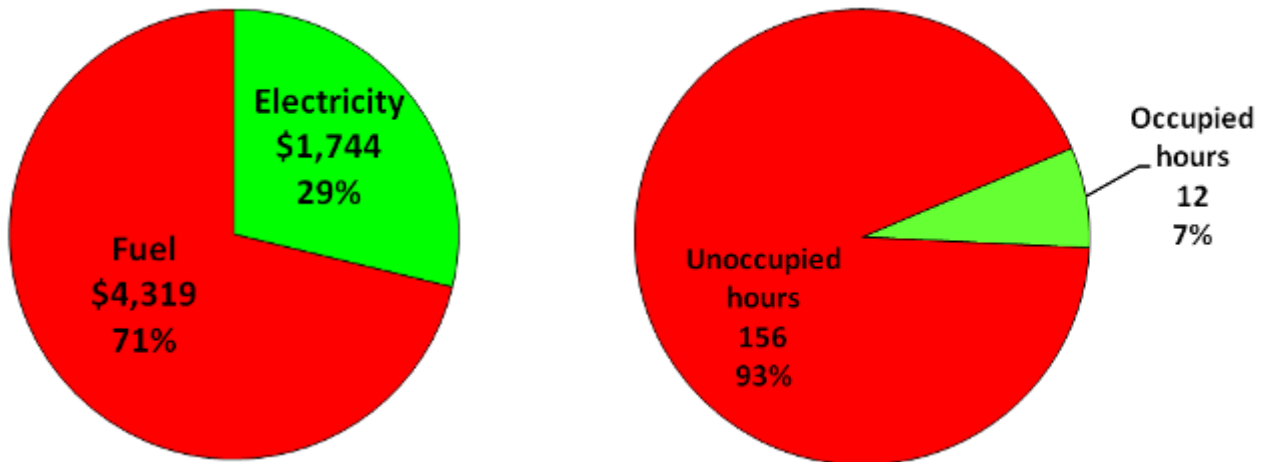
It is simple to locate a qualified partner simply by going to the following web site and putting in your zip code. http://www efficiencymaine.com/at-work/qualified-partners/qualified_partner_search



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ENERGY USAGE

Below is the breakdown and comparison of the energy usage for 2011. Fuel oil expense exceeds electrical costs by 42 percent. Also on a weekly basis, the unoccupied hours exceed occupied hours by 86 percent.



The table below compares your building to the Department of Energy's Northeast Average for Commercial Buildings. The average Northeast building uses .23 gallons per square foot and your building is at .29 gallons per square foot.

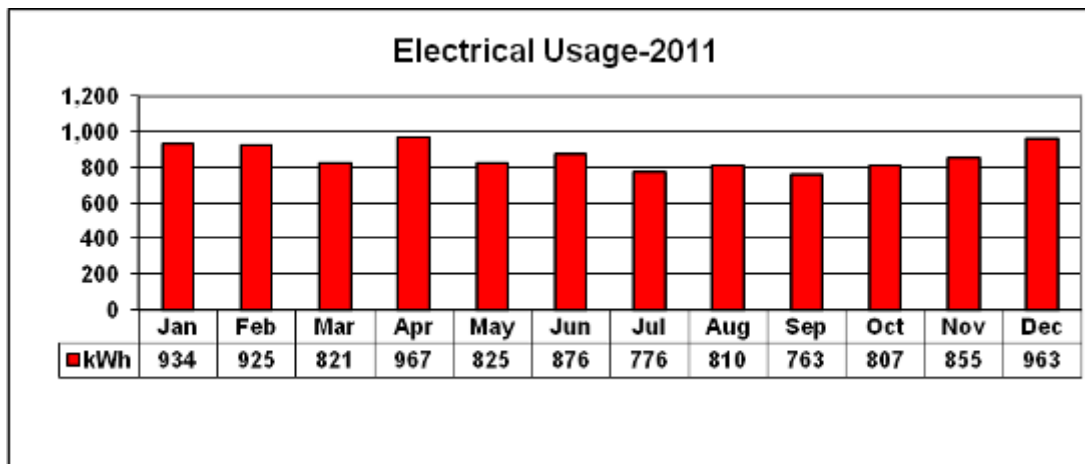
Department of Energy Fuel Oil Comparison		
Commercial Buildings Energy Efficiency	Northeast Average	Lamoine Fire Dept.
		5,280
	Btu's / SF /year	Btu's / SF/ year
Space heating Fuel oil Btu's	32,000	40,807
	Gal / SF / Yr	Gal / SF / Yr
Space heating Fuel oil gallons	0.23	0.29
* http://www.eia.doe.gov/emeu/rep/abstracts/northeast.html#Commercial		
Note that Northeast average includes New Jersey to Maine		

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Kilowatt hour (Kwhr) usage is itemized below followed by a graph depicting electrical usage by month for 2011. Yearly, the Lamoine Fire Department consumed 10,322 Kwhr's at a cost of \$1,744, averaging \$145 per month and a gross cost of \$.169 per kWh.

Profiling usage in this manner allows for review by the month and season and visually highlights potential problems. For example, we see the heating season ramp up in October through February with another small spike in April (although not sure if the reported kWh amount is accurate), then drops somewhat for the summer months.

Lamoine Fire Department			
Electricity Usage			
		kWh	Cost
	Jan	934	\$163.42
	Feb	925	\$146.51
	Mar	821	\$169.16
	Apr	967	\$142.80
	May	825	\$150.80
	Jun	876	\$123.73
	Jul	776	\$140.19
	Aug	810	\$138.31
	Sep	763	\$132.81
	Oct	807	\$139.72
	Nov	855	\$147.25
	Dec	963	\$148.88
	Total	10,322	\$1,744
	Monthly Avg's	860	\$145
	Avg \$/kWh		\$0.169



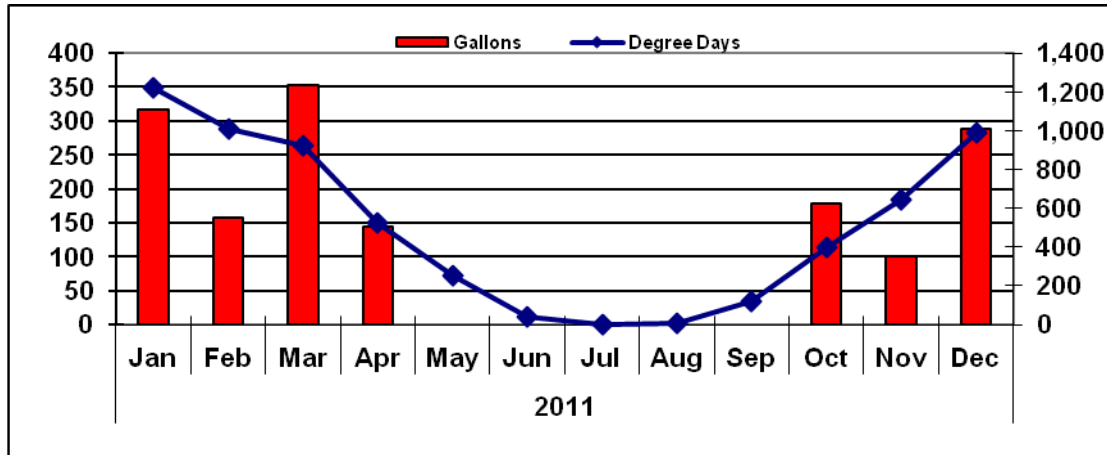
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Fuel Oil: Number 2 fuel oil consumption for 2011 was 1,539 gallons for a total cost of \$4,319. Average gross price for the year was \$2.81 per gallon. Oil consumption for 2011 is itemized and graphed below.

Lamoine Fire Department				
Fuel Usage				
		Gallons	Cost	Degree Days
2011	Jan	317.00	\$790.93	1,221
	Feb	158.00	\$394.59	1,012
	Mar	353.00	\$882.15	920
	Apr	144.00	\$368.30	524
	May			252
	Jun			40
	Jul			0
	Aug			6
	Sep			120
	Oct	178.00	\$592.28	397
	Nov	101.00	\$334.66	641
	Dec	288.00	\$956.16	989
	Total	1539.00	\$4,319	
Monthly Avg		219.86	\$617	
Avg cost per gal			\$2.81	

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For your information: What are annual Heating Degree Days (HDD)? Heating degree days are calculated by how much colder the average temperature is than 65°F on a given day.



A system in control and with minimum standby losses, the fuel consumption (red bars) would closely follow the heating degree day curve (blue line).

You will note that the fuel consumed during very cold months falls below the blue degree day curve. This means that your heating controls are most likely set back on a regular basis which is saving energy. It is important to note that fuel oil consumption is a function of fuel deliveries that may lead to a misinterpretation of actual consumption.

LIGHTING

Comments:

- Existing lighting in the office, truck bays and meeting room areas consists of original T-12 lamps and magnetic ballast.
- Lamps have been upgraded to energy efficient lamps.
- There are no automatic lighting controls in the building.

Recommendations:

- Retrofit the existing fixtures with **H**igh **P**erformance T8 lamps and electronic ballast.
- Efficiency Maine lighting incentives apply and can be found in Appendix A and at
http://www efficiencymaine.com/docs/at_work/910PrescLightingApRetrofit.pdf

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The table below is the estimated savings that may be achieved by upgrading your lighting.

Estimated Annual Lighting Savings												
	Location	Fixture type	# of units	Watts per Unit	Max Total kW	Hrs/ Week	# of Weeks	Annual Operating Hours	Annual Total kWh	Annual kWh Cost	Potential Annual Savings	Annual kWh Saved
										\$0.169		
Existing	Meeting Room	2' x 4' 4-Lamp T12 w/Magnetic Ballast	9	160	1.44	20	52	1040	1,498	\$253		
Retrofit		2' x 4' HP* 4-Lamp T8 w/Electric Ballast	9	118	1.06	20	52	1040	1104	\$187	66	393
Existing	Main Floor	8' 2-Lamp T12 w/Magnetic Ballast	17	138	2.35	20	52	1040	2,440	\$412		
Retrofit		8' 2-Lamp HP* T8 w/Electronic Ballast	17	109	1.85	20	52	1040	1927	\$326	87	513
Existing	Dispatch & Chief	2' x 4' 4-Lamp T12 w/Magnetic Ballast	2	173	0.35	20	52	1040	360	\$61		
Retrofit		2' x 4' HP* 4-Lamp T8 w/Electric Ballast	2	109	0.22	20	52	1040	227	\$38	22	133
Existing	Stairs	4' 2-Lamp T12 w/Magnetic Ballast	1	80	0.08	20	52	1040	83	\$14		
Retrofit		4' HP 2-Lamp T8 w/Electronic Ballast	1	60	0.06	20	52	1040	62	\$11	4	21
Existing	Outside	150 W HPS Wallpacks	3	188	0.56	82	52	4264	2,405	\$406		
Retrofit		No change										
					Est Annual kW savings				Annual Total kWh	Annual kWh Cost	Potential Annual Savings	Annual kWh Saved
Estimated Annual Lighting Usage and Cost					1.6				6,785	\$1,147		
Estimated Annual Lighting Savings											\$179	1,060
The tables for informational purposes only. Always consult your lighting professional before specifying new technology for your facility.												
The estimated annual savings are based on a general walk through of the building and the reported operating hours.												
Detailed energy savings should be determined by your electrician, supplier or manufacturer before a purchase is completed.												
Your electrician, supplier or manufacturer must confirm that the proposed lighting meets the Efficiency Maine prescriptive cash incentives.												
You can find Efficiency Maine incentives at www.efficiencymaine.com/pdfs/Prescriptive-Cash-Incentives.pdf .												
* High Performance												

Energy Audit Report

Below is the estimated cost, savings and simple payback to replace the fire station lighting.

Lighting Estimate			
	Qty	Cost each	Total
Re-Lamp & Ballast Meeting Room	9	\$40	\$360
Electrician	9	\$55	\$495
Re-Lamp & Ballast Truck Bays	17	\$50	\$850
Electrician	17	\$55	\$935
Re-Lamp & Ballast Dispatch & Chief's Office	2	\$50	\$100
Electrician	2	\$55	\$110
Re-Lamp & Ballast Stairs	1	\$50	\$50
Electrician	1	\$55	\$55
Contingency	5	\$55	\$275
Estimated installed capital cost			\$3,230
Efficiency Maine Incentive Lighting	17	\$25	\$425
Estimated Incentive total			\$425
Cost to Implement (capital cost-incentives)			\$2,805
Estimated annual electrical savings kWh	1,060	\$0.169	\$179
Estimated annual electrical demand savings kW			\$0
Estimated annual electrical savings			\$179
Simple Payback in Years			15.7
Labor for replacing lamps is estimated at .75 hour per fixture.			
Labor for sensors included with lighting labor.			
Quote for lighting provided by Gilman Electric in Newport 368-4306.			

BUILDING ENVELOPE

Comments:

- The building walls are insulated with six inches of fiberglass insulation.
- Ceiling is estimated to have 12 inches of fiberglass insulation.
- The windows are all double pane.

Recommendations:

- Inspect and repair the door weatherstripping as needed.
- Main side door should be replaced, door frame is sprung.
- 2nd floor meeting room door requires major weatherstripping

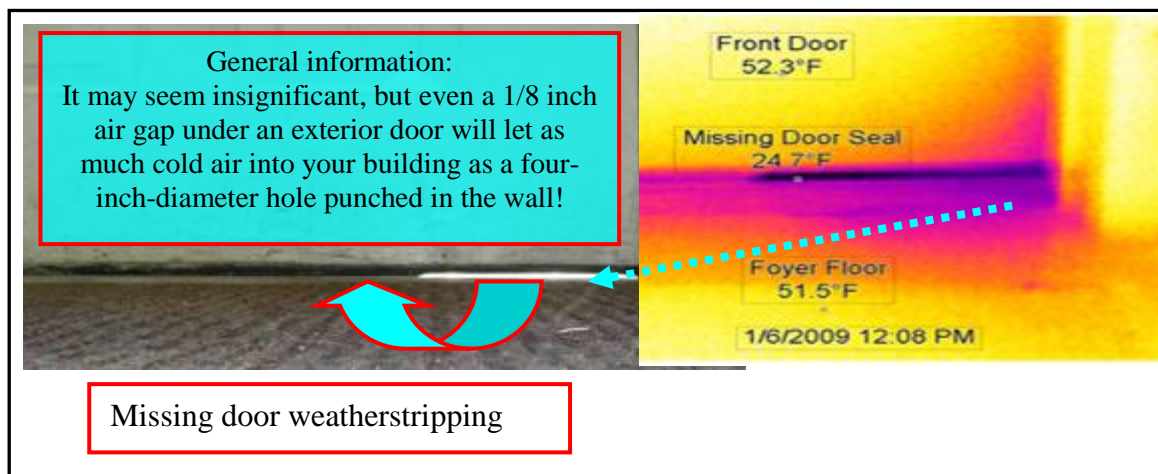


Main side door entrance



2nd floor meeting room door

Below is a typical commercial entry door with missing weatherstripping on a cold 25 ° F January day--note the temperature at sill with the weather stripping missing is 24.7°F.



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Comment:

- Hose drying shaft appears open at the top right.
- Fiberglass over the top.
- Shaft acts as a chimney exhausting heated air from the building and exhausting through the attic ventilation.

Recommendation:

- From the attic close off the very top right side of the shaft (top right). (Picture is not clear.)
- Remove the fiberglass insulation from the top and install plywood to cover opening.
- Insulate the shaft from the outside using ridged insulation on the exterior of the shaft walls.



Comment:

- Attic used as storage, compressing insulation negating some of its R-value.

Recommendation:

Remove all material for the attic and re-fluff the fiberglass insulation.



HEATING SYSTEM

Please note that the energy conservation measures identified in this section may require professional services to implement.

Comments Boiler

- Heat is provided by System 2000 hydronic boiler.
- It was reported that the heat transfer coil has been compromised and a new boiler will be required.
- There is a Carlin burner that fires at a rate of 1.2 gallons per hour.
- Heat distribution for the building is provided by an in-floor radiant heat system.
- The boiler heats an 80 gallon storage tank and then the heated water is distributed to the radiant floor zones - see pictures below.



Recommendations

- It was reported that the heat transfer coil has been compromised and a new boiler will be required.
- New boiler should include an outside temperature reset control that can provide up to 5-10% additional savings.
- Consider as an alternative replacing the failed oil fired system with a high efficient propane boiler.
- Propane may be advantageous since there is radiant floor heating in place which requires a lower water temperature
- High end fuel oil burners are rated at 85% efficiency whereas propane can achieve 90-95% efficiencies.
- Propane burners can modulate whereas fuel oil cannot.
- Be sure that a mechanical heating professional calculates the potential savings that may be achieved by switching from fuel oil to propane.
- Propane burns cleaner requiring cleaning every two to three years.
- 5 to 10% is the estimated reduction in fuel consumption that may be achieved by installing a higher efficient propane boiler.

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- It is important to note that fuel oil has a Btu value of approximately 140,000 Btu's per gallon vs. 90,000 Btu's per gallon for propane thereby impacting the percentage of savings.

The table below indicates your fuel oil consumption and cost for 2011. The table also is useful for projecting heating cost using the percentage of savings and the escalating cost of fuel oil per gallon.

If you replace your existing boiler with an oil-fired unit (@ 85% efficiency) with reset temperature controls, then you may see 5-10% percent in savings (based on the actual efficiency of the old boiler). The area highlight in red indicates your potential savings at current prices and you see the escalated savings to the right as the prices of oil increases.

Estimated Fuel Oil Savings Based on Cost Per Gallon					
Gallons of fuel oil used in 2011	1,539	215,460,000 Btu's			
Fuel oil cost per gallon	\$2.81	\$3.00	\$3.25	\$3.50	\$4.00
Annual Fuel oil cost	\$4,325	\$4,617	\$5,002	\$5,387	\$6,156
5 percent savings	\$216	\$231	\$250	\$269	\$308
10 percent savings	\$432	\$462	\$500	\$539	\$616
15 percent savings	\$649	\$693	\$750	\$808	\$923
20 percent savings	\$865	\$923	\$1,000	\$1,077	\$1,231
30 percent savings	\$1,297	\$1,385	\$1,501	\$1,616	\$1,847

Below is a typical estimated cost, savings and simple pay back. This typical estimate is based on an 85% efficient fuel oil boiler with an air temperature reset control and 10% savings of the 2011 fuel oil consumption at \$4 per gallon.

Estimated Boiler Replacement Simple Payback			
Equipment/Labor	Qty	cost each	Total
Install New High Efficient Boiler	1	\$5,000	\$5,000
Labor	24	\$70	\$1,680
Contingency and commission	4	\$70	\$280
Removal and Disposal	1	\$1,000	\$1,000
Estimated installed capital cost			\$7,960
Fuel oil savings based on new fuel oil boiler ~10% of 2011	154	\$4.00	\$616
Simple pay back in years (cost / savings)			12.9

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Below is a typical estimated cost, savings and simple pay back. This typical estimate is based on a 90% efficient propane boiler with an air temperature reset control and 5% savings of the 2011 fuel oil consumption at \$4 per gallon.

Estimated Boiler Replacement Simple Payback			
Equipment/Labor	Qty	cost each	Total
Install New High Efficient Propane Boiler	1	\$5,000	\$5,000
Labor	24	\$70	\$1,680
Propane tank and piping	1	\$1,000	\$1,000
Contingency and commission	4	\$70	\$280
Removal and Disposal	1	\$1,000	\$1,000
Estimated installed capital cost			\$8,960
Service call savings per year	1	\$300	\$300
Fuel oil savings based on new 90% Propane boiler (~5% of 2011's fuel oil @ \$4 /gal)	77	\$4.00	\$308
Simple pay back in years (cost / savings)			14.7

A third option is to replace the failed heat transfer coil and add an outside temperature reset control.

It is noted that the original boiler's efficiency was most likely at approximately 75-80%. It is also noted that fuel oil provides more Btu's per gallon (oil ~ 140,000 vs. Propane ~90,000 Btu's/gal).

It is your responsibility to determine installation, equipment and labor cost for all estimated ECM's before proceeding. Every effort was made to assure accuracy of the estimated results, however, they do not represent or guarantee, or assume or accept, that these savings, capital cost or simple paybacks will be achieved.

Please remember that this is a basic walk-through energy audit. Cost estimates were not done based on any design or engineering. They are conceptual only and can be +/- 15%. Professional services may be required to enable an accurate estimate.

DOMESTIC HOT WATER

Comments:

- Hot water is provided by an indirect storage tank that is heated by the boiler and stored in a 20 gallon SuperStor tank.
- This is a new tank and will be connected to the new boiler when installed.



The table below is the estimated hot water use and gallons of hot water on a yearly basis.

Estimated Hot Water Demand						
Fixture	Units	Gals per minute	mins / day	gals / day	days / year	Gal Year
Restroom sink	1	2	4	8	50	400
Meeting room sink	1	1	4	4	50	200
						0
Estimated total gallons per year						600
Days per year hot water is used						50
Estimated gallons of hot water used per day						12
These are estimates based on the number of fixtures and reported estimated use						

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In summary, there are a number of energy reducing consumption opportunities identified for your building. I hope you take the opportunity to review and investigate these potential savings opportunities. For specific questions or comments regarding this report, you may contact:

Richard (Dick) Fortier
(207)-453-4485
rfortier2@myfairpoint.net

or

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Certified Energy Manager
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elizabeth.crabtree@efficiencymaine.com




American Recovery and Reinvestment Act


Appendix A

Lighting incentive application can be found at:

http://www.efficiencymaine.com/docs/at_work/910PrescLightingApRetrofit.pdf

 <p>Lighting Incentives</p>			
L10	HPT8 Relamp & Reballast - Existing fixture	\$12.00	Per Fixture
L10.1	Reduced Wattage HPT8 Lamp & Ballast - Retrofit	\$12.00	Per Fixture
L15	New Fluorescent Fixtures - Retrofit	\$25.00	Per Fixture
L16	New Fluorescent Fixtures - New construction	\$10.00	Per Fixture
L20	Fluorescent Fixtures with Reflectors	\$25.00	Per 8' Section
L25	Compact Fluorescent Hard-wired Fixtures	\$12.00	Per Fixture
L30	High-Efficiency Fluorescent Fixtures - Retrofit	\$35.00	Per Fixture
L30.1	High-Efficiency Fluorescent Fixtures - Reduce Wattage	\$35.00	Per 4' Section
L32	Low-Glare High-Efficiency Recessed Fixture - Retrofit	\$50.00	Per Fixture
L32.1	Low-Glare High-Efficiency Recessed Fixture - Reduced Wattage	\$50.00	Per Fixture
L33	Low-Glare High-Efficiency Recessed Fixture - New construction	\$35.00	Per Fixture
L35	Pendant Mounted Indirect Fluorescent Fixtures	\$35.00	Per 4' Section
L40	High-Intensity Fluorescent (H.I.F.) - Retrofit	\$65.00	Per Fixture
L60	Fixture Mounted Occupancy Sensor	\$40.00	Per Fixture
L70	Occupancy Sensors - Remote mounted only	\$50.00	Per Control
L71	Vacancy Sensors	\$25.00	Per Control
X10	LED Exit Signs - Retrofit only	\$10.00	Per Sign

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 <p>Efficiency Maine LED Lighting Incentives</p>		
S10	Outdoor pole/arm-mounted LED streetlight or parking light fixture	\$175.00 per fixture
S12	Outdoor wall-mounted LED area fixture (wallpack)-- must be DesignLights approved	\$175.00 per fixture
S14	LED parking garage fixture--must be DesignLights approved	\$175.00 per fixture
S20	Recessed, surface and pendant-mounted LED downlight-- must carry Energy Star label	\$35.00 per fixture
S30	Refrigerated case LED light fixture--must be DesignLights approved	\$75.00 per door \$100.00 per door with occupancy sensor
S40	Screw-in LED lamps--must carry Energy Star label	\$20.00 per lamp
http://www.efficiencymaine.com/docs/at_work/910PrescLightingApRetrofit.pdf		